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9 Attorneys for Plaintiff
MICRON TECHNOLOGY, INC.

11 **UNITED STATES DISTRICT COURT**
12 **NORTHERN DISTRICT OF CALIFORNIA**

14 MICRON TECHNOLOGY, INC.,

15 Plaintiff,

16 v.

17 UNITED MICROELECTRONICS
CORPORATION, FUJIAN JINHUA
18 INTEGRATED CIRCUIT CO., LTD.,
and DOES 1-10,

19 Defendants.

Case No. 4:17-CV-06932-JSW

**DECLARATION OF WHONCHEE LEE IN
SUPPORT OF PLAINTIFF MICRON
TECHNOLOGY, INC.'S OPPOSITION TO
DEFENDANT UNITED
MICROELECTRONICS CORPORATION'S
MOTION TO DISMISS FOR LACK OF
PERSONAL JURISDICTION**

Judge: Hon. Jeffrey S. White
Courtroom: 5, 2nd Floor
Hearing: March 23, 2018 at 9:00 a.m.

Complaint Filed: December 5, 2017

23 I, Whonchee Lee, declare as follows:

24 1. I am an engineer employed by Micron Technology, Inc. ("Micron") in Boise,
25 Idaho. I have been working with Micron since 1995 (except a short break), holding various
26 positions such as engineer (at different levels) and senior technical staff.

27 2. This declaration is based on my personal knowledge such that, if called to testify on
28

1 these matters, I could competently do so.

2 3. On about October 18, 2016, I was asked by Micron personnel to attend an October
3 23, 2016 event in Santa Clara, California. It was a recruiting event jointly held by the Chinese
4 American Semiconductor Professional Association (“CASPA”), headquartered in Sunnyvale,
5 California, and Fujian Jinhua Integrated Circuit Co. Ltd. (“Jinhua”). Anyone interested could
6 register for the event through CASPA’s website. Attached hereto as **Exhibit 1** is a true and correct
7 copy of the event advertisement taken from the CASPA website at
8 <http://www.caspa.com/events/delegation/event-list/57ed63e7a049721a78aaca1>. I signed up and
9 traveled to Santa Clara for the event. I also met up with my wife, who was briefly employed in the
10 Bay Area at that time.

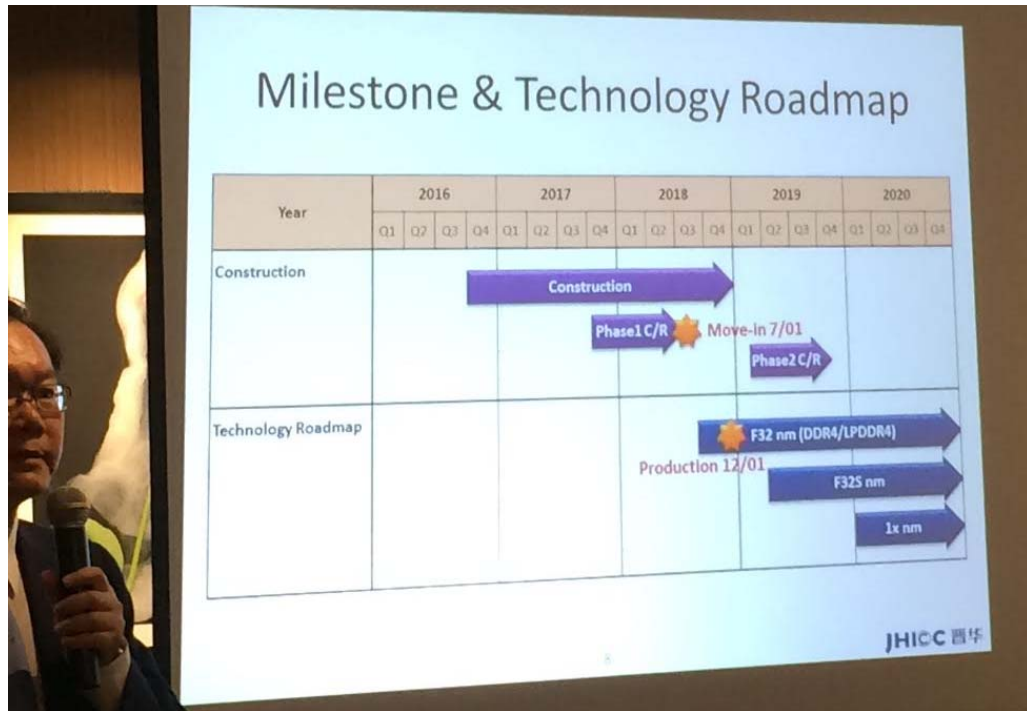
11 4. In the morning of October 23, 2016, my wife and I drove to the Hyatt Regency
12 Santa Clara to attend the CASPA/Jinhua event. The recruiting event started at noon with a lunch
13 presentation, followed by a networking and interview session. About 30 to 35 people attended the
14 recruiting event, approximately 90 percent of whom were Chinese working in the United States.
15 At the event, there were more than 10 recruiting people from Jinhua and about two to three
16 individuals from United Microelectronics Corp. (“UMC”) to answer questions about technology
17 development. I did not recall seeing any Micron employees at the recruiting event other than
18 myself.

19 5. During the lunch presentation, a speaker from Jinhua introduced the Chinese
20 government’s plan to manufacture dynamic random-access memory (DRAM) through Jinhua and
21 to use the DRAM in various products, such as personal computers, automobiles, and consumer
22 devices. He stated that Jinhua planned to construct at least two semiconductor fabrication plants
23 (commonly called “fabs”), and laid out its plans as follows:

- 24 a. **First fab:** Construction started on July 16, 2016, pilot runs would start in the
25 fourth quarter of 2017, and production would start in the third quarter of 2018.
26 b. **Second fab:** Construction would be completed by December 31, 2018, pilot
27 runs would start in the first quarter of 2019, and production would start in the
28

fourth quarter of 2019.

6. The Jinhua speaker's presentation is shown in the following photograph, which my wife took during the presentation. (Numerous invitees were taking pictures without any objections from the Jinhua speaker.)

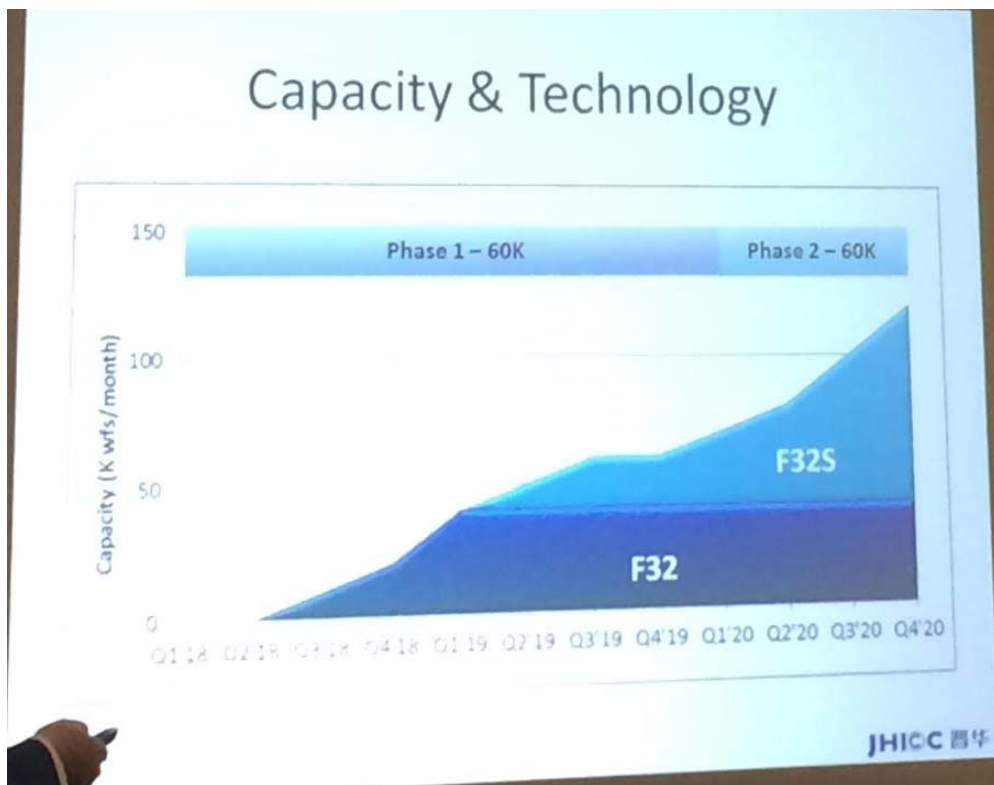


7. As can be seen in the photograph above, the Jinhua speaker went on to talk about the technology types that Jinhua planned to use for its DRAM productions and referred to them as "F32 nm," "F32S nm" and "1x nm." As an engineer who had worked in the integrated circuit ("IC") industry for almost 20 years by then, I understood that "1x nm" referred to a fabrication process (also known as "node process") of less than 20nm (nanometer), but I had not heard of "F32 nm" or "F32S nm" until then. In semiconductor fabrication, terminologies such as "20nm" generally refer to half of the distance between cells on an IC. Thus, the smaller the number is, typically the more advanced the product is because more cells can be included on the circuit.

8. At one point, an audience member asked the Jinhua speaker how Jinhua could manufacture DRAMs since they did not appear to have the technology. The Jinhua speaker stated that Jinhua was not concerned about DRAM technology development because UMC would provide the technology; however, Jinhua would need many new employees experienced in DRAM

1 technology to effectively carry out its DRAM manufacturing plans with the UMC technology.

2 9. Subsequently, a speaker from UMC took over the presentation to explain the
3 DRAM technology development. He mentioned that “F32” referred to the 25nm node process and
4 “F32S” referred to the 20nm process. The UMC speaker stated that UMC had started developing
5 its 25nm DRAM technology, and would have the technology ready when Jinhua’s first fab
6 construction was completed in 2018. He also stated that UMC would transfer the 25nm DRAM
7 technology to Jinhua during the third quarter of 2018 for pilot runs and then mass production.
8 According to him, Jinhua would start mass production of DRAM chips using the 25nm node
9 process (*i.e.*, F32) in the first quarter of 2019 and would begin using the 20nm node process (*i.e.*,
10 F32S) in 2020, as can be seen in the following photo of his presentation, which was also taken by
11 my wife.



25 10. I do not recall the name of the UMC speaker, but I do recall what he looks like. I
26 have been able to identify the speaker as an individual identified in news sources as Stephen Chen
27 (Chinese name: 陳正坤). I was able to recognize Mr. Chen from the following photos, which are
28 true and correct copies of photographs taken from the exhibits to this declaration.



See **Exhibit 3.**



See **Exhibit 4.**



See **Exhibit 5**.



See **Exhibit 2**.

11. **Exhibit 2** to this declaration is a true and correct copy of a 2016 announcement by the Department of Materials Science and Engineering at National Cheng Kung University, together with a certified English translation. This document is publicly available at:

<http://www.eng.ncku.edu.tw/bin/downloadfile.php?file=WVhSMFIXTm9MekF2Y0hSaFh6WXd>

OalUzWHpRM016WXhNREpmT1RjeE56UXVjR1Jt&fname=TWpBeE51ZVVvdWFscmVpcmx1V2poK2l6aCtpb2lpNXdaR1k9.

12. **Exhibit 3** to this declaration is a true and correct copy of a September 8, 2015 news article entitled “DRAM veteran Stephen Chen joins UMC” by *Touch News*, with a certified English translation. This document is publicly available at:

<http://e6705003.pixnet.net/blog/post/45290738-dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB>.

13. **Exhibit 4** to this declaration is a true and correct copy of a February 23, 2017 news article entitled “Taiwan DRAM industry veteran Stephen Chen to assist China’s Jinhua in plant construction” by Li Lihua at *TaiDaily.com*, with a certified English translation. This document is publicly available at: <http://www.taidaily.com/?p=11034>.

14. **Exhibit 5** to this declaration is a true and correct copy of a December 10, 2017 news article entitled “China made a Major Breakthrough in Self-made Memory Wafers, 2019 will be a Critical Year” by *Pixpo.net*, with a certified English translation. This document is publicly available at: <https://www.pixpo.net/post440608>.

15. After the lunch presentation at the CASPA/Jinhua recruiting event on October 23, 2016, Jinhua and UMC personnel stayed to answer questions from interested candidates and to collect résumés. **Exhibit 6** is a true and correct copy of the Jinhua flyer that was made available in connection with the event. According to the job descriptions on Jinhua’s flyer, they were recruiting people for various aspects of DRAM technology, including research and development, manufacturing, and sales and marketing. My wife and I left after the lunch presentation since we were not interested in applying to those positions.

///

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1 I declare under penalty of perjury under the laws of the United States of America that the
2 foregoing is true and correct to the best of my knowledge and belief.

3 Executed on this 28 day of February 2018, in Boise, Idaho.

4
5
6 By: 
7

8 Whonchee Lee
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NAI-1503471645v3

EXHIBIT 1



CASPA 華美半導體協會

CHINESE AMERICAN SEMICONDUCTOR PROFESSIONAL ASSOCIATION

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[Scholars...](#)
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Seminar

Job Fair

Delegation

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ASE GROUP



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ca



APPLIED MATERIALS



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北京京信安和微电子技术股份有限公司

Platinum Spons...

华美半导体 福建晋华集成 成电路有限公司硅谷推介会 CASPA-Fujian Jinhua Integrated Circuit Co Ltd Silicon Valley Delegation

Oct 23, 2016

DESCRIPTION

Time: 12:00 pm-3:30pm Oct 23, 2016 (Sunday)





Location: Hyatt Regency Santa Clara, 5101 Great America Parkway, Santa Clara, CA 95054

About JHICC:





Fujian Jinhua Integrated Circuit Co., Ltd. (JHICC) is an advanced IC manufacturing enterprise, which is mainly invested and established by Fujian Electronics & Information (Group) Co., Ltd., and Jinjiang Energy Investment Co., Ltd. JHICC has conducted technical cooperation with Taiwan United Microelectronics Corporation and invested 5.65 billion US dollars to build a 12" fabrication facility in Jinjiang City to develop advanced memory technology and process technics and carry out the manufacturing and sales of related products. JHICC has been included into the IC crucial manufacturing arrangement of China's 13th "Five-Year-Plan". The company regards it as its duty to realize the domestic manufacturing of IC chip and aims to become an advanced IC manufacturing enterprise with independent intellectual property system.

About this event:





JHICC will have an introduction and recruiting event on Sunday,

Gold Sponsors

Alliances

10/23, 12:00pm-3:30pm, at Hyatt Regency Santa Clara, 5101 Great America Parkway, Santa Clara, CA 95054

Agenda:

12-1pm Introduction and Lunch

Keynote Speaker: Albert Wu, Operations VP/COO of Fujian jinhua Integrated Circuit Co., Ltd.

1-3:30 Networking and interview

There are job openings for DRAM Process Technology, DRAM Product Design, DRAM Device Design, Sales & Marketing.

[Register Link](#)

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Follow us!












EXHIBIT 2



United Language Group
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State of Minnesota)
)
County of Hennepin) ss:

Certificate of Accuracy

This is to certify that the attached translation is, to the best of our knowledge and belief, a true and accurate and complete translation of the attached document, carried out by translators competent to translate from Chinese into English.

Dated: February 28th, 2018

Kate Kaurova
Senior Project Manager, Legal Translations
United Language Group

Sworn to and signed before
Me, this 28th day of
February 2018



Notary Public

2nd Industrial Forum of the Department of Materials Science and Engineering, NCKU

Breakthrough for Taiwanese companies: Innovations and Strategies
Theatre B1, NCKU at 1:30pm on 2016. 12. 9 (Friday)

Speech by guest: Dr. Huey-Jen Jenny Su the President

13:40–15:00 Session 1

[Hosted by] Professor Jen-Sue Chen of Department of Materials, NCKU

[Speakers]

Siliconware Precision Industries Co., Ltd. – Deputy General Manager Mike Ma (Class of '71 alumni)

Topic: High value added Innovation- be a Doer, not just a Thinker

(High value-added innovation - be a doer, not just thinker)



Dr. Mike Ma graduated from the Faculty of Materials Science and Engineering, North Carolina State University (NCSU). He has managed the Silicone Products Research & Development Centre for 6 years since 2010 and has developed the next generation advanced sealing technology in the period. He is now the spokesperson for smart finance and marketing of the Center. Dr Ma has 18 years of experience in Wafer Manufacturing in various countries (Taiwan, Singapore and the USA) in different fields including operation, R & D and marketing.

Seagate Technology –Steve Hwang, Deputy General Manager, R&D (Class of '72 alumni)

Topic: Alumni of the Department of Materials Science and Engineering of NCKU Welcome Taiwan's third economic miracle – Innovation and Research & Development

Dr. Steve Hwang graduated from the Department of Metallurgy & Materials Engineering, NCKU and has earned a master's degree from the Department of Materials Science and Engineering, National Taiwan University and Engineering Doctorate from University of Utah in 1990. He completed the Leading Management Talents training course of the Harvard Business School in 2005 and advanced leadership course of Stanford University in 2014.



In 1990, Dr Hwang moved to the Silicon Valley where he has resided and worked for 26 years by now. He has served Seagate Technology as Chief Technician and was named the Best Leading Executive of North American Seagate in 2004. He became Seagate's Deputy General Manager in 2006 and now leads a 400-strong R & D team besides managing R & D funds in annual mount of US\$0.12 billion. He is the only Chinese Deputy General Manager in Seagate.

United Microelectronics Corporation - Stephen Chen, Senior Deputy General Manager (Class of '74 alumni)

Topic: Trends and Opportunities in the Memory Industry



Stephen Chen graduated from the Department of Materials and Engineering, NCKU and is now the Senior Deputy General Manager of United Microelectronics.

In his 27-year career in DRAM, he has served Powerchips Semiconductor (PSC) as Director of Process Integration, Factory Director, Deputy General Manager (Operations), Senior Deputy General Manager (Memory). He was also General Manager of Rexchip, President and General Manager of the listed company Zentel Electronics. In August 2013, he was appointed President and General Manager of Micron Memory Taiwan. Mr Stephen Chen is an excellent talent of R & D, operation and corporate governance in Taiwan's semiconductor industry.

Tung Ho Steel Enterprise Corporation - Bing-Hua Huang, Deputy General Manager (Class of '78 alumni)

Topic: Start with Advertising for Tung Ho Steel Enterprise

B.H. Huang graduated from the Department of Metallurgy & Materials Engineering, NCKU and joined Tung Ho Steel Enterprise in 1991 where he has worked until now.

Currently he is: Deputy General Manager (Sales) of Tung Ho Steel Enterprise

General Manager of Tung Kang Steel Structure
President of Tung Ho Steel Vietnam



15:00–15:20 Break

15:20–17:00 Session 2

[Hosted by] Professor K-F. Chiu of Department of Materials, Feng Chia University

[Speakers] Abico Capital Management Co., Ltd –You Zhiyuan, General Manager (Class of '81 alumni)

Topic: Innovation and Strategies for SMEs in Taiwan



Alumni You Zhiyuan earned a degree in Executive Master of Business Administration degree from National Chiao Tung University and has served a number of investment companies including CTBC as Deputy General Manager (Venture Capital). He is now serving Asia Investment Fund responsible for investment and management. Mr You has more than 20 years' experiences in venture capital and has been appointed as director and supervisor by a number of investment companies for his expertise in corporate governance, management practice, strategy planning and M&A. He has helped the companies grow steadily in business development and capital market, and maintains continuous cooperation with them to fulfill the objective of win-win situation for the company and investors.

**IV Technologies Co., Ltd – General Manager Yang Weiwen
(Class of ‘82 alumni)**

**Topic: What should a company do to win in adversity, create
competitiveness and breakthrough the market?**



Yang Weiwen earned his doctorate from the Department of Materials Science and Engineering, NCKU. Having served various companies including Silicon Integrated Systems, United Microelectronics and Organic Light, he is now the General Manager of IV Technologies Co., Ltd.

Seminar on Innovations and Strategies

[Hosted by] Compal Electronics, Asia Pacific Businesses – Deputy Section Director Peng Xinlin

Organizers: Alumni Association of Department of Materials Science and Engineering, NCKU and
Department of Materials Science and Engineering, NCKU

第二屆成材產業論壇

『台灣企業的出路：創新與策略』

2016. 12. 9 (五) 1:30 pm 成大圖書館 B1 演講廳

貴賓致詞：蘇慧貞校長

13:40–15:00 Session 1

【主持人】成大材料系 陳貞夙特聘教授

【講員】



矽品精密工業股份有限公司－馬光華副總經理 (71 級系友)

講題：High value added Innovation- be a Doer, not just a Thinker

(高附加值創新_不只要想，更要作)

馬光華博士畢業於美國北卡州立大學(NCSU)材料科學及工程系，2010 起主持矽品研發中心達 6 年，負責開發次世代之高階封裝技術。現負責矽品之智財及市場行銷並擔任公司發言人。馬博士亦在半導體前段晶圓製造(Wafer Manufacturing)產業，有 18 年跨國(台、星、美)/ 跨公司/ 跨領域 (營運、研發、行銷) 之經歷。

希捷科技－黃國興研發副總經理 (72 級系友)

講題：成材人迎接台灣第三次經濟奇蹟- 創新與研發

黃國興博士畢業於成大冶材系，台大材料所碩士，1990 取得猶他大學工程博士。2005 完成哈佛商學院學習領導管理人才培訓課程，2014 年史丹福大學學習高階領導課程。

黃博士從 1990 年到矽谷居住工作，至今有 26 年。曾擔任希捷首席技術員，2004 年被票選為希捷北美最佳領導幹部，2006 年成為希捷研發副總經理。目前領導一支 400 人的研發團隊，管理年度美金 1.2 億的研發經費，也是希捷在美國唯一華人副總經理



聯華電子股份有限公司－陳正坤資深副總經理 (74 級系友)

講題：記憶體產業的趨勢與機會

陳正坤先生畢業於成功大學材料工程學系，現任聯華電子資深副總經理。

在 DRAM 產業資歷逾 27 年。曾任力晶科技製程整合處長、廠長、營運副總、記憶體事業群資深副總，瑞晶電子總經理，力積電子董事長及總經理，並掛牌上市。2013 年 8 月擔任臺灣美光董事長及總經理。陳正坤先生為台灣半導體產業中，研發、營運、企業管理能力兼具的傑出人才。

東和鋼鐵企業股份有限公司－黃炳樺營業部副總經理 (78 級系友)

講題：從東和鋼鐵做廣告開始

成功大學冶金及材料工程研究所碩士，1991 年進入東和鋼鐵研發部迄今

現任：東和鋼鐵 營業部副總經理

東鋼鋼結構 總經理

東鋼越南 董事長



15:00–15:20 中場休息

15:20–17:00 Session 2

【主持人】逢甲材料系 邱國峰特聘教授

【講員】



能率資本管理顧問公司－游智元總經理 (81 級系友)

講題：台灣中小企業的創新與策略

游智元學長獲國立交通大學高階管理碩士，曾任職中國信託創投副總經理等多家創投公司，目前負責能率亞洲資本基金的投資及管理。從事創業投資工作達 20 年時間，擔任多家被投資公司董監事，專長在公司治理、管理實務、策略規劃、企業併購等。協助公司在業務發展及資本市場上穩定成長，與公司長期合作，達到公司及投資人雙贏目標

智勝科技股份有限公司－楊偉文總經理 (82 級系友)

講題：企業如何逆中求勝、打造競爭力、突破市場

成大材料博士，曾任職矽統科技、聯華電子、悠景科技，現職為智勝科技總經理。



創新與策略座談會

【主持人】仁寶電腦亞太事業群－彭幸林副處長

主辦：成大材料系友會、成大材料系

EXHIBIT 3



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State of Minnesota)
)
County of Hennepin) ss:

Certificate of Accuracy

This is to certify that the attached translation is, to the best of our knowledge and belief, a true and accurate and complete translation of the attached document, carried out by translators competent to translate from Chinese into English.

Dated: February 28th, 2018

Kate Kaurova
Senior Project Manager, Legal Translations
United Language Group

Sworn to and signed before
Me, this 28th day of
February 2018



Notary Public

DRAM veteran Stephen Chen joins UMC @ TOUCH NEWS -- 947 :: PIXNET ::

[e6705003.pixnet.net/blog/post/45290738-](http://e6705003.pixnet.net/blog/post/45290738-dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB)

[dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4-](http://e6705003.pixnet.net/blog/post/45290738-dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB)

[%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB](http://e6705003.pixnet.net/blog/post/45290738-dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB)

DRAM veteran Stephen Chen joins UMC

2015-09-08 02:40:18 Economic Times Reporter Jian Yong-Xiang/from Taipei



Stephen Chen, DRAM veteran and former General Manager of Micron Taiwan. (United Daily News Group Archive)

Share

Rumors have it that Stephen Chen, DRAM veteran and former General Manager of Micron Taiwan is leaving DRAM, a field which he has engaged in for more than 2 decades. He will join United Microelectronics Corporation (UMC) as Senior Deputy General Manager to help with the construction and operation of UMC's 12 Inch Wafer Fab in Xiamen of Mainland China.

CERT. ULG

Stephen Chen said he has already left Micron Taiwan uttering that ‘a break is needed before the new journey’. Rumors have it that he will join UMC but no direct response was received from Chen in this connection. He emphasized that if he rejoins the workforce, his priority will be helping with development of the Taiwanese semi-conductor business, but his decision is unknown yet.

UMC maintains a low key on the personnel case. It emphasizes that all personnel changes will be disclosed as important messages, and said it is not convenient to comment on whether the company has hired Stephen Chen.

According to an informer, Stephen Chen is scheduled to join UMC on 16 September as Senior Deputy General Manager. Chen’s change of lane also implies that a new wave of personnel reshuffles will soon take place in the related heads of Micron Taiwan and Asia.

Stephen Chen will leave the DRAM and help build the 12 Inch Wafer Fab in Mainland China. This also reflects the rapid development of the Mainland semi-conductor industry; the shift of global semi-conductor industry center towards Mainland China, and important figures in the trade will become the pioneers on whom all factories will rely for extending their footprints.

Stephen Chen is a veteran in the DRAM industry. He was once an engineer of Nanya Technology and Senior Deputy General Manager of Powerchips Semiconductor (PSC). With expertise in the construction and management of 12 Inch Wafer Fabs, he is important leader of PSC’s 12 Inch Wafer Fab team. He was PSC’s first General Manager in 2007 when the company established Rexchip jointly with Elpida.

In his 20-year career in DRAM, Chen experienced both the most glorious and saddest moments. When Rexchip was merged into Micron eventually upon bankruptcy of Elpida, it was converted into Micron’s branch company led by Stephen Chen as General Manager.

UMC established the United Semi jointly with the Xiamen government. The construction works of the first Taiwan-invested 12 Inch Wafer Fab will commence this April. UMC has decided to appoint You Zhaosheng, President of HJTC, as United Semi’s President, with Raymond Hsu, Deputy General Manager of UMC Tainan plant as General Manager. Stephen Chen’s participation in the construction of the 12 Inch Wafer Fab will help speed up the completion of the Fab in Mainland China.

UMC emphasizes that the 12 Inch Wafer Fab in Xiamen will take into account future advancement
CERT. ULG

in the process, but they will start with the 55/40 nm processes in the early period as specified in the related policy. Currently, these advanced processes are technologies much sought after in the Mainland China market. In the future, the Xiamen plant will manufacture 28 nm and below if permissible under the Taiwan laws.

UMC adopts the segmentation strategy for positioning in the Mainland market starting from medium-low end mobile phone chips, panel driving IC, and imbedded flash memory and imbedded non-volatile memory for IoT. According to UMC's schedule, the Xiamen 12 Inch Wafer Fab will try out in Q3 next year, followed by pilot production in Q4 next year with monthly output of 6,000 units per month expected in the beginning.

Biography of Stephen Chen

Date of birth	1963, aged 52
Academic level	Bachelor's degree from the Department of Materials Science and Engineering, National Cheng Kung University, Master's degree from the Department of Materials Science and Engineering, National Tsing Hua University
Important experiences	Senior Deputy General Manager of PSC; General Manager of Rexchip; General Manager of Micron Taiwan
Important achievements	<ul style="list-style-type: none"> ● Help PSC with construction of the first Taiwan-invested 12 Inch Wafer Fab ● Helped PSC turn from deficit to profits with efficient management when he was factory director in PSC
Hobbies	Rugby, golf
Source: Collation of interview data Jian Wen-Xiang/tabulation	

Diagram/Provided by *Economic Times*

About the creator

Eric

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DRAM老將陳正坤 投效聯電 @ 開鑫閣閣 --947 :: 痞客邦 PIXNET ::

e6705003.pixnet.net/blog/post/45290738-dram%E8%80%81%E5%B0%87%E9%99%B3%E6%AD%A3%E5%9D%A4%E6%8A%95%E6%95%88%E8%81%AF%E9%9B%BB

DRAM老將陳正坤 投效聯電

2015-09-08 02:40:18 經濟日報 記者簡永祥／台北報導



DRAM老將、美光台灣分公司前任總經理陳正坤。（聯合報系資料庫）

分享

DRAM老將、美光台灣分公司前任總經理陳正坤傳將離開拚戰20多年的DRAM領域，將於本月中旬投效聯電出任資深副總經理，協助聯電大陸廈門12吋晶圓廠建廠及營運。

陳正坤說，他已離開美光台灣分公司，「要休息一下再出發」。外傳將投效聯電，陳正坤未正面回應，他強調，若再投入職場，會以協助台灣半導體產業發展為優先考量，但目前尚未決定動向。

聯電對相關人事案也很低調，強調所有高階人事案會以重大訊息方式揭露，至於是否網羅陳正坤，不便發表評論。

消息人士透露，陳正坤預定9月16日轉投效聯電，出任資深副總。陳正坤換跑道，也意味美光台灣分公司及亞洲區相關主管即將展開新一波換血行動。

陳正坤離開DRAM產業，將協助聯電在大陸興建12吋廠，也反映出大陸半導體產業快速發展，全球半導體重心向大陸移動，相關半導體大將將會成為各廠倚重拓展版圖的先鋒。

陳正坤是台灣DRAM業的老兵，曾任南亞科工程師及力晶資深副總，擅長12吋廠興建與管理，是力晶集團打造12吋晶圓艦隊的重要推手。2007年力晶與爾必達合資成立瑞晶，他出任第一任總經理。

陳正坤在DRAM領域拚戰20多年，經歷最輝煌及最悲慘的時刻，瑞晶最終因爾必達破產而併入美光集團，成為美光台灣分公司，由陳正坤擔任總經理。

聯電與廈門官方合資成立聯芯半導體公司，興建台廠首座12吋晶圓廠，今年4月動工，聯電敲定由和艦董事長尤朝生兼任聯芯半導體董事長，聯電台南廠區副總經理許智清擔任總經理。陳正坤加入聯電廈門12吋廠興建，有助提升聯電大陸12吋廠建廠效率。

聯電強調，廈門12吋廠會考量製程推進的未來性，但初期會在政策規範下，從55／40奈米製程切入，目前這兩個製程是大陸市場迫切需要的技術，也是屬於先進製程，未來若台灣法律允許，廈門廠也會布建28奈米以下製程。

聯電在大陸市場定位採區隔策略，切入中低階手機晶片、面板驅動IC，以及應用在物聯網所需的嵌入式快閃記憶體、嵌入非揮性記憶體等。聯電規劃廈門12吋廠明年第3季投片、第4季試量產，初期月產能6,000片。

陳正坤小檔案

生日	1963年，52歲
學歷	成大材料系學士、清大材料所碩士
重要經歷	力晶資深副總經理、瑞晶總經理、美光台灣分公司總經理
重要事蹟	<ul style="list-style-type: none"> ●協助力晶興建台灣第一座12吋晶圓廠 ●任職力晶廠長期間，以高效率管理協助力晶轉虧為盈
嗜好	橄欖球、高爾夫

資深來源：採訪整理

簡永祥 / 製表

圖／經濟日報提供

創作者介紹

Eric

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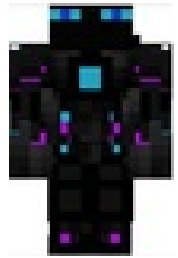


EXHIBIT 4



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Dated: February 28th, 2018


Kate Kaurova
Senior Project Manager, Legal Translations
United Language Group

Sworn to and signed before
Me, this 28th day of
February 2018




Notary Public

Taiwan DRAM industry veteran Stephen Chen to assist China's Jin Hua in plant construction

taidaily.com

News Center

23 February 2017



(聯華電子: UMC)

[By Li Lihua, Reporter] Stephen Chen, Senior Vice President of United Microelectronics Corporation (“UMC”), assumed the post of President of Fujian Jinhua Integrated Circuit Co, Ltd. (“JHICC”) a Dynamic Random Access Memory (‘DRAM’) plant in Fujian province, China, UMC said. Stephen Chen would assist JHICC in plant construction and mass production by JHICC would commence as early as in 2018.

UMC accepted a commission last year by JHICC, which was invested by the Fujian provincial government, to develop DRAM related process technology.

Currently, UMC has a team of hundreds of staff in its fabrication plant in the Southern Taiwan Science Park, engaging in the R&D of DRAM related process technology. The initial plan is to focus on 32nm process technology.

According to a mutual agreement, special equipment and technical compensation as R&D fee
CERT. ULG

based on development progress will be provided by JHICC and the R&D achievements will be jointly owned by both companies.

Apart from assisting in the R&D of DRAM related process technology, UMC agreed to the appointment of Stephen Chen as president of JHICC to assist in plant construction.



According to a resolution passed by the Board of UMC on the 20th of this month, Stephen Chen would be released from non-competition restrictions to allow him to engage in competitive conduct for a period of one year from the date of his appointment as president of JHICC to the end of December this year.

Prior to joining UMC, Stephen Chen, a veteran in the country's DRAM industry, was Senior Vice President of Powerchip and President of its memory product business, as well as President of Rexchip, a joint venture subsidiary of Powerchip and Japan's Elpida.

JHICC would commence mass production as early as in 2018 and Stephen Chen would not participate in JHICC's operation going forward, UMC said.

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台灣DRAM老將陳正坤 助大陸晉華建廠

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新聞中心

2017-02-23



【記者李麗華報導】聯電資深副總經理陳正坤出任中國大陸福建省動態隨機存取記憶體(DRAM)廠晉華集成電路總經理，聯電表示，陳正坤將協助晉華建廠，晉華最快2018年量產。

聯電去年接受由福建省政府投資的晉華集成電路委託，開發DRAM相關製程技術。

聯電目前已在南科廠籌組數百人團隊，開始投入DRAM相關製程技術開發，初步規劃將從32奈米製程切入。

據雙方協議，晉華將提供特用設備，並依開發進度支付技術報酬金作為開發費用，開發成果將由雙方共同擁有。

聯電除協助開發DRAM製程技術外，並由陳正坤出任晉華總經理，協助建廠。



聯電董事會22日決議解除陳正坤競業禁止限制，許可從事競業行為期間為就任晉華總經理之日起 1年內，即至今年12月底止。

陳正坤加入聯電前，曾任力晶資深副總經理暨記憶體產品事業群總經理，及力晶與日商爾必達合資子公司瑞晶總經理，堪稱是國內DRAM業老將。

聯電表示，晉華最快2018年量產，未來陳正坤將不會主導晉華營運。

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Notary Public

China made a Major Breakthrough in Self-made Memory Wafers, 2019 will be a Critical Year

(MIT Technology Review APP in English and Chinese is now available. Yearly subscribers may watch weekly technology class live and access the science and technology English learning forum~)

Zhao Weiguo, Chairman of the Tsinghua Unigroup, has been in a very good mood recently. He would burst into laughter whenever meeting others. In the "Dialogue" program hosted by CCTV and the Global Digital Economy Forum at Wuzhen Internet Conference, he even talked about the dream of making Chinese "chips".



Figure | Zhao Weiguo at the Global Digital Economic Forum of the Wuzhen Internet Conference

What pleased Zhao Wei the most was the recent success in the R&D of 32-layer 64G 3D NAND Wafer, led by Yangtze Memory Technologies Company (YMTC) of Tsinghua Unigroup. This was the first success in the self-development of memory wafers in China, and a major step in combatting international manufacturers monopolies.

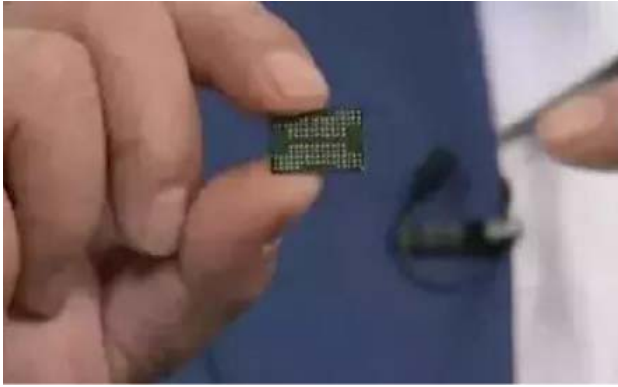


Figure | 32-layer 64G 3D NAND by YMTC

Undeniably, the predicament in China's semiconductor industry can be ascribed to the following: in spite of being the largest semiconductor market in the world, China have to rely heavily on imports. For example, for over 90% of DRAMs and NAND Flash wafers which have been in the greatest demand, international major manufacturers have to be relied on. DT believes that to break this situation, the key is the year of 2019!

In 2019, the achievements in the technology development by three major memory forces in China will be revealed, including the next generation 64-layer 3D NAND wafers by YMTC, the 2x Nanotechnology by Fujian Jinhua Integrated Circuit (JHICC) with the support of UMC, and the 19-nanometer DRAM technology by Hefei Innotron Memory (Innotron).

Would the critical R&D achievements of DRAM and 3D NAND technology be surprisingly breaking the monopolies of international manufacturers? Or would it be just an ugly daughter-in-law to see her parents-in-law? The answer to this question will determine the destiny of China's memory industry in the coming decade.



The self-development of DRAM and 3D NAND technology is only in its infancy in China, but the dense obstacles lying ahead can already be felt, along with the fierce transnational legal battles. Because of this, some are starting to question: why not take a shortcut which is simply licensing by international manufacturers? This way, the wafers may be manufactured in a lawful and compliant manner, the continuous judicial threats could also be avoided. Pay the money to avoid disasters, pay what has to be paid, then one can produce its own wafers and still be able to meet the domestic demands.

However, how different is it between being clear-minded and drinking poisonous water to stop thirst? It is a matter of a flash of thought. Many senior executives with rich memory industry experience told DT that Mainland China must not walk the same path that Taiwan has walked, which is obtaining technology licenses and serving as OEMs of large manufacturers.

The 20 years of industrial development in DRAM in Taiwan is, simply put, 20 years of labour for the United States, Japan, Europe and manufacturers from other countries. In the end, Taiwan still could not have its own technologies, instead it only earned a title of "DRAM plant with the lowest production costs". When foreigners are faced with their own operational issues, or otherwise have to cancel the technology licensing out of other considerations, the DRAM manufacturers in Taiwan have to suddenly face the dilemma of lacking technology, as a result, their stock prices plummeted inevitably.

What is even more saddening is the reality that 20 years of hard work will be gone in vain, because every time when the memory industry falls into a recession, DRAM manufacturers

are not faced with low gross margins, but more likely negative gross margins - it is not rare for them to burn tens of millions every day. It will not take long before they face shortage of working capital, and by then it could only sell its wafer fabs at a low price to foreigners. After 20 years of hard work, no technology was obtained, ownership of the wafer factory was lost, think about it, which company can afford such a heavy blow?

The lesson is not old, in the memory semiconductor industry, Chinese manufacturers should understand they cannot step on this same path. No matter how hard it is, they have to stick to technology self-development.



Figure | Gao Qiquan, Executive Vice President of Tsinghua Unigroup

Gao Qiquan, Executive Vice President of Tsinghua Unigroup, believes that China's development of memory wafers can no longer rely on the old way of licensed OEM. It must develop technologies independently and pay if others' patents are used. In the meantime, self-owned patents must be accumulated. If in the end, success cannot be achieved, one has to accept the reality.

When asked why he joined the DRAM technology joint R&D program between UMC and mainland China, Stephen Chen, General Manager of JHICC, said in a sensational but sharp manner that Micron's acquisition of Rexchip in the past was a shock to him, and that developing DRAM technologies independently has always been his dream. He hopes that the seed of this dream could be sown here!



Figure | Stephen Chen, General Manager of Fujian Jinhua

Both Gao Qiquan and Stephen Chen are veterans in the memory industry for over 20 years, having engaged in countless battles. Their lament entails 20 years of toil and moil. However, with the determination that they will not make the same mistakes again, these people are planning to revolutionize China's memory semiconductors industry.

In terms of the current distribution of the three major global DRAM players, Samsung, SK Hynix, Micron's market shares are respectively 46%, 27%, 21%, meaning that over 90% of the global DRAM wafers are controlled by South Korea and the United States, of which, South Korea controls more than 70%. China must become the third largest force in the global DRAM industry besides South Korea and the United States in order to balance the industrial ecology and have leverage in negotiations in the global semiconductor industry.



(三星電子: Samsung Electronics)

SK 海力士: SK Hynix

美光集團: Micron Group)

Figure | the three major DRAM manufacturers in the world

In fact, the difficulty of DRAM technology R&D does not lie in the technology itself, but in that DRAM patents having been firmly gripped by the international manufacturers. The real obstacle is that one has to develop while avoiding all existing patents. Even though Chinese manufacturers make painstaking efforts to make innovative breakthrough in DRAM R&D, it is quite likely that they haven't reached the mass production phase before they receive letters of attorney from Samsung and SK Hynix with respect to patent infringement.

In fact, it has been common for the major manufacturers in the United States and South Korea to use law as a weapon to intimidate opponents. These days, Micron has filed lawsuit in the United States against UMC and JHICC for trade secrets misappropriation with respect to their technologies that are still in R&D phase. This is not the first time that Micron has attempted to stop Chinese manufacturers' DRAM R&D plans.

Back in the beginning of 2017, before the Chinese New Year, Micron, with the aim of preventing staff from changing jobs, took advantage of the time when they were back home celebrating the Chinese New Year, filed a lawsuit on the ground of trade secrets misappropriation in Taiwan and imposed exit restrictions on some of the staff. The news shocked the memory semiconductor industry, reminding people of the aggressive style of the US manufacturer. But in the meantime, Micron's precaution against China's memory semiconductor industry could also be sensed.



Because of this, the two DRAM manufacturers, JHICC and Hefei Innotron, kept a low profile from the very beginning and concentrated on R&D with their doors shut.

But now the difficulty of these two players lies in that Micron's DRAM technology and processes as reference and simulation was mainly used for the initial R&D settings. With Micron's extensive legal means deterring any possible technological plagiarism, JHICC and Hefei Innotron had to keep away from Micron's designs and switch to the path of the South Korean manufacturers. However, such a change will pose considerable challenges and will lead to delays in R&D and mass production. Further observation is required.

Nevertheless, concerns of Micron and other manufacturers are not ungrounded. At the end of 2017, the good news about the successful development of 32-layer 3D NAND wafers by YMTC excited Zhao Weiguo on the one hand, gave real pressure to international manufacturers on the other.

Figure YMTC Summary of NAND Flash Events

- 2001 Samsung, Macronix and other manufacturers conceived idea of 3D
- 2007 3D NAND Flash officially launched: Toshiba invented a new bit column stacked method
- 2013 Samsung launched 3D NAND Flash product "V-NAND"

2016 Samsung, SK Hynix and Micron increased investment, with investment amount reaching 15.1 billion, 5.1 billion and 3.8 billion US Dollars respectively in 2016

Three challenges faced by YMTC: 1. Backward technology 2. Talent shortage 3. Excessive supply in the future, plummeting prices

At the beginning of November 2017, the 3D NAND wafer developed by YMTC of Tsinghua Unigroup, was inserted into SSD together with NAND Flash controlling wafer. After it was connected to the terminal system, the system was successfully activated.

The shocking "activation" means the system connection test of the first Chinese-made 3D NAND wafer was successful, that the R&D was successful, and the Chinese memory industry has just taken a big step forward. While the news may be interpreted as a preliminary success of the YMTC's R&D in 3D NAND wafers, do not rush into indulging in self-satisfaction, because there is still a long way to go before achieving actual success.

First of all, compared to the mainstream 64- and 72-layer technologies of Samsung Electronics, Micron, Toshiba and SK Hynix, the 32-layer technology of 3D NAND wafer developed by YMTC is still falling behind considerably. In 2018, those international manufacturers will step into the 96-layer 3D NAND technology era, with density of driving wafer increased and costs further reduced.



(竞争对手技术推进时间表: Schedule of technological advancement of competitors)

Figure | Schedule of technological advancement of YMTC's competitors

Furthermore, the success of R&D and commercial mass production are two distinct aspects. Although successful R&D is the critical first step, it is not a guarantee for mass production of wafers.

For wafers to enter the mass production stage, the yield rate must first reach a certain level, otherwise it is not in line with production cost effectiveness. The 3D NAND wafer used by YMTC for testing is definitely the selected "cream" of the units. However, it does not mean that each wafer produced can pass the test. Therefore, only when the yield rate is high enough can the quantity of "creams" be larger.

However, according to DT's observation, YMTC is not so naive and optimistic to think that they can progress smoothly henceforth. Despite the ahead-of-schedule R&D, YMTC's strategy is not aggressive, instead they progress step by step towards the target.

YMTC regard the success of the R&D of 32-layer 3D NAND technology as a foundation and use it to prove the feasibility of the R&D. They do not intend to mass produce at this stage because the company is well aware that for the mass-produced 3D NAND to be cost competitive, they must have 64-layer technology as a foundation.

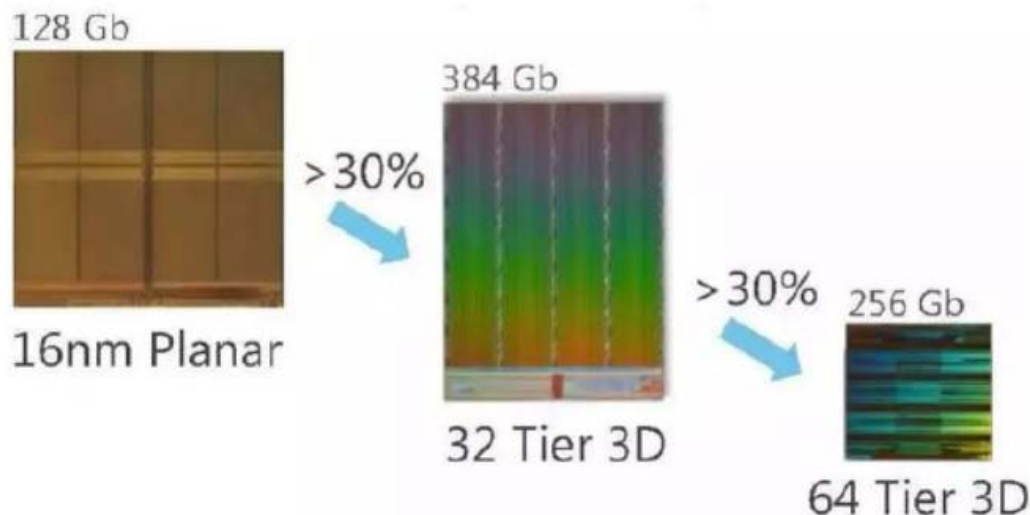


Figure | Lowering costs per unit storage space for NAND

In 2018, YMTC will have its 32-layer 3D NAND technology produced in small quantities. The more important battle is to succeed in the R&D of 64-layer 3D NAND technology.

At the Global Digital Economy Forum of World Internet Conference, Zhao Weiguo also said that YMTC will enter the 64-layer 128G 3D NAND wafer stage in the next year, and it is estimated that another 2 billion U.S. dollars of R&D costs will be spent.

In addition, the 12-inch memory fab in Wuhan, with a monthly capacity of 300,000 units, which Tsinghua Unigroup has been planning for long and has invested up to 24 billion US dollars in, , can be officially launched expectedly in 2019 to 2020.

The other chipmaker, JHICC and UMC, which have been sued by Micron in both Taiwan and the US for patent infringement, have a model for DRAM collaboration different from other market players.

UMC was entrusted by JHICC in 2016 to develop DRAM-related production technologies. JHICC will pay UMC technological fees as compensation for the development efforts based on the development progress. The ultimate DRAM technologies developed by both companies will be jointly owned by them.

Under the above cooperation agreement, UMC will set up a DRAM R&D team and a pilot production line of more than 100 people in Southern Taiwan Science Park, and simultaneously carry out two R&D's of 2x and 3x nanometers.

Another DRAM player is Hefei Innotron, which has been laying low from the its foundation up to now. Its leader is Wang Ningguo, former global vice president of Applied Materials, a major semiconductor manufacturer, and former President and CEO of SMIC, and Liu Dawei, former senior executive of Inotera Memories.

Hefei Innotron's layout started in the second half of this year and started to emerge gradually. This includes the cooperation with NOR Flash maker, Beijing Giga Device, which announced an agreement with the Hefei government to invest RMB18 billion (20% by Giga Device, 80% by Hefei Industry Investment Group), to research and develop 19 nm DRAM technology. With the agreement, Giga Device can be guaranteed production capacity.

Although Beijing Giga Device started its business in the smaller NOR Flash industry, it has had the ambition of diversifying into the DRAM industry. As early as a year ago, there was

widespread rumour in the memory industry regarding this, but the company has never admitted it.

In September this year, the IC Development Fund (Large Fund) announced that it would acquire about 11% stake in Giga Device and become the second largest shareholder. It was not until then that the company's layout in the DRAM industry and its cooperation with Hefei Innotron was disclosed publicly frequently.

The two major DRAM forces both completed R&D at the end of 2018. Accordingly, mass production cannot be commenced until around 2019. Therefore, 2019 will be a critical year to China's memory industry, with JHICC and Hefei Innotron's DRAM technology unveiling themselves, along with YMTC's advancement in the R&D and production of 64-layer 3D NAND. For the next two years, these manufacturers will make waves of progresses in R&D and mass production, which will decide the destiny of China's memory industry. The year of 2019 will be a very exciting year for China's semiconductor industry.

中國存儲自製晶元取得重大突破，2019年將決勝負

 pixpo.net/post440608

(《麻省理工科技評論》中英文版APP現已上線，年度訂閱用戶每周直播科技英語講堂，還有科技英語學習社區哦~)

紫光集團董事長趙偉國近來心情極好，逢人就笑開懷，更在央視《對話》節目和烏鎮網際網路大會的全球數字經濟論壇上暢談打造中國「芯」的夢想。



圖 | 烏鎮網際網路大會的全球數字經濟論壇上的趙偉國

能讓趙偉國這麼開心，正是因為近期紫光旗下的長江存儲成功研發 32 層 64G 的 3D NAND 晶元，搶下中國存儲自製晶元的第一名，對於實現打破國際大廠壟斷局面的目標，跨出關鍵性一大步！

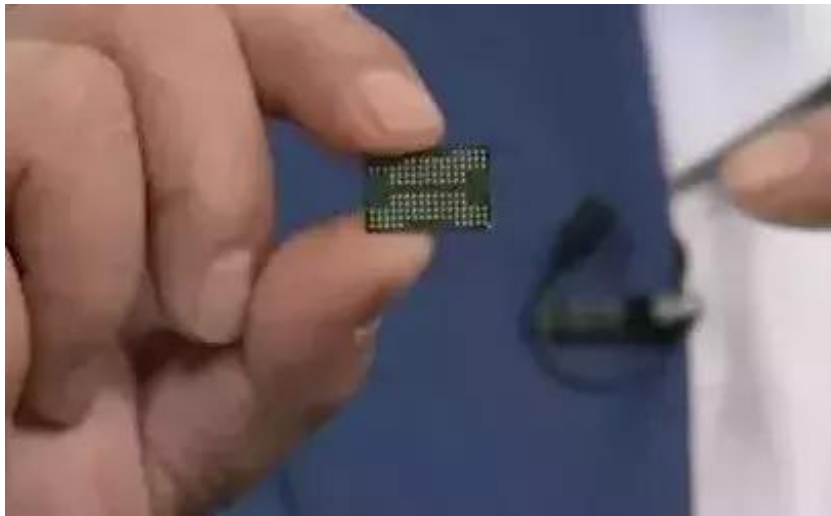


圖 | 長江存儲 32 層 64G 的 3DNAND 晶元

不可否認的是，當前中國半導體的艱難局面來自於：中國身為全球最大的半導體市場，但卻必須高度依賴進口，以需求量最大的 DRAM 和 NAND Flash 晶元為例，9 成以上都依靠國際大廠。而要打破這樣的局面，DT 君認為，關鍵就在 2019 年！

2019 年，中國三大存儲陣營的技術開發成果將見真章，包括長江存儲的下一代的 64 層 3D NAND 晶元、聯電扶植的福建晉華集成的 2x 納米技術，以及合肥睿力的 19 納米 DRAM 技術。

這關鍵的 DRAM 和 3D NAND 技術研發成果，究竟會石破天驚打破國際大廠的壟斷？抑或只是醜媳婦終究是要見公婆？這問題的答案，將決定未來十年中國存儲產業的命運。



自主 DRAM 和 3D NAND 技術這條道路，中國才處於萌芽階段，但已可以感受到前方是荊棘密布，伴隨刀光劍影的跨國法律大戰。也就是因為如此，有人開始質疑，為什麼不走捷徑，乾脆與國際大廠技術授權合作，既可以合法合規的生產品元，又可免除接連不斷的司法威脅？反正破財消災，付該付的錢，就能生產自有晶元，照樣能夠支持國內需求。

但醍醐灌頂與飲鴆止渴之間的差別有多大，其實就在於一念之間。多位具有豐富存儲器產業經驗的高層人士告訴 DT 君，大陸萬萬不可再像台灣一樣，走上拿技術授權、幫大廠代工的老路。

回顧台灣 DRAM 過去 20 年的產業發展腳步，講白了，等於是為美、日、歐等國大廠打了 20 年工，到最後仍是無法擁有自己的技術，只換來「生產成本最低的 DRAM 廠」的稱號。當外國人基於自身營運窘迫，或是另有考量而要收回技術授權時，台灣 DRAM 廠頓時面臨技術斷炊的窘境，股價重挫是必然的結果。

但更讓人痛心的，是二十年心血一朝付諸東流的現實，因為每當存儲器產業發展陷入衰退期，DRAM 廠面臨的不是低毛利率，而更可能是負毛利率的處境，每天燒掉幾千萬都不是新鮮事。不用多久，就會面臨營運資金短缺的狀況，到那時，就只有將手上的晶圓廠便宜賣給外國人。20 年的苦心經營，最後落到技術也拿不到、晶圓廠也保不住，仔細想想，有哪一家企業承受得起這樣的重擊。

前車之鑒不遠，在存儲半導體這條路上，中國大陸廠商應該很清楚，不能再踏上這條不歸路，再怎麼苦，也要堅持技術自主！



圖 | 紫光集團執行副總裁高啟全

紫光集團執行副總裁高啟全就認為，中國發展存儲晶元不能再走授權代工的路，一定要技術自主開發，用到別人的專利就付錢，同時也累積自己手上的專利實力，如果最後真的無法成功，那也必須接受事實。

福建晉華總經理陳正坤曾被問及為什麼要加入聯電和中國大陸 DRAM 技術合作研發計劃，陳正坤感性但一針見血的說，當年瑞晶被美光兼并這件事對他的衝擊非常大，且自主開發 DRAM 技術一直是他心中的夢想，希望這個夢想從他這裡播種開花！



圖 | 福建晉華總經理陳正坤

高啟全、陳正坤都曾經是在過去 20 年存儲產業身經百戰的沙場老將，他們的感嘆，是 20 年的血淚，但現在，這群人帶著前錯不再犯的決心，要將中國存儲半導體產業扭轉乾坤。

以目前全球三大 DRAM 陣營的勢力分佈來看，三星、SK 海力士、美光的市佔率分別為 46%、27%、21%，意即全球 DRAM 晶元有超過 90% 都掌握在韓美兩國手上，尤其是韓國，手握超過 70% 的 DRAM 晶元，而中國必須成為全球 DRAM 產業除了韓、美以外的第三大勢力，才能平衡產業生態，也才能在全球半導體產業中取得上桌談判的資格。



圖 | 全球三大 DRAM 廠商

其實，DRAM 技術的研發，真正的困難點不在技術本身，而是 DRAM專利都已經被國際大廠牢牢握住，要避開所有現有的專利來進行開發，才是真正的障礙。即使中國廠商千辛萬苦創新突破完成 DRAM技術研發，很可能還不到量產階段，就先收到三星、SK 海力士控告專利侵權的律師函。

事實上，美國與韓國大廠以法律當武器恫嚇對手的做法，早已是屢見不鮮的事，這幾天，美光就針對聯電和福建晉華目前仍在研發階段的DRAM 技術，在美國提出涉嫌妨礙運營機密的控告。而這並不是美光第一次出手阻止中國廠商的 DRAM 研發計劃。

時間拉回 2017年初的新年前，美光為了防止員工跳槽，趁著這批人回家過年時，在台灣提出妨礙營業機密訴訟，進行大規模約談，並對其中部份人員限制出境。這個消息當時震驚了存儲半導體產業，讓人見識到美國大廠強悍作風，但在其中，卻也嗅得出美光對於中國存儲晶元產業超高度防備警戒。



也因為如此，福建晉華、合肥睿力兩大 DRAM 技術陣營從一開始，就維持極為低調的行事風格，關起門來專心研發。

但現在這兩大陣營的難處在於，研發初期的設定主要是參考和模擬美光 DRAM的技術和流程，由於美光設下天羅地網的法律手段嚇阻任何可能的技術抄襲，讓福建晉華與合肥睿力都必須規避美光的設計，改走韓系大廠路線，但這樣的轉變，挑戰相當大，會不會導致研發和量產時程延後，恐要進一步觀察。

但是，美光等大廠的擔心不是沒有道理的，2017 年底，中國存儲產業傳出的長江存儲成功研發 32 層 3D NAND晶元的好消息，不但讓趙偉國眉開眼笑，也讓國際大廠感受到實實在在的壓力。

图 长江存储投资 NAND 闪存事件概览。



2017 年 11 月初，紫光旗下的長江存儲投入研發將近兩年的 3D NAND 晶元，在搭配 NAND Flash 控制晶元置入 SSD，且連接上終端系統后，該系統成功「動」起來。

這驚天一「動」，背後代表的意義，是首顆中國制的 3D NAND 晶元成功通過終端產品的測試，宣告研發成功，中國存儲產業向前邁進了一大步。這樣的消息，或許可以解讀為長江存儲投入研發 3D NAND 晶元的初步成功，但也不要太快陷入驕傲的迷思里，因為距離實際的成功，仍有一段很長的路。

首先，長江存儲研發的這顆 3D NAND 晶元是 32 層技術，對比三星電子、美光、東芝、SK 海力士主流的 64 層和 72 層技術，還有一段距離，而這些國際大廠在 2018 年即將大步跨入 96 層 3D NAND 技術，驅動晶元的密度提升、成本再下降。



圖 | 長江存儲競爭對手技術推進時間表

再者，研發成功和商業化量產，是兩個截然不同的層次。研發成功雖然是關鍵的第一步，但並非是晶元量產的保證。

晶元要進入量產階段，良率要先達到一定的水準，否則是不符合生產成本效益的。而長江存儲用來測試的這一顆 3D NAND 晶元，絕對是精挑萬選出來的「精英部隊」，然而不代表生產出來的每一顆晶元都可以通過測試，因此，必須要讓良率夠高，晶圓產出中的「精英部隊」數量才會更多。

但根據 DT 君的觀察，長江存儲並不是真的那麼天真樂觀的以為自己就此一帆風順，儘管研發速度超前目標，但長江存儲的策略並不冒進，而是有目標地按部就班前進。

長江存儲把這次研發成功的 32 層 3D NAND 視為打底的技術，要用該技術來證明研發的可行性，但並不打算現在就大量產出。因為，公司很清楚知道，大量生產後的 3D NAND 要具備成本競爭力，至少要有 64 層技術底蘊才行。

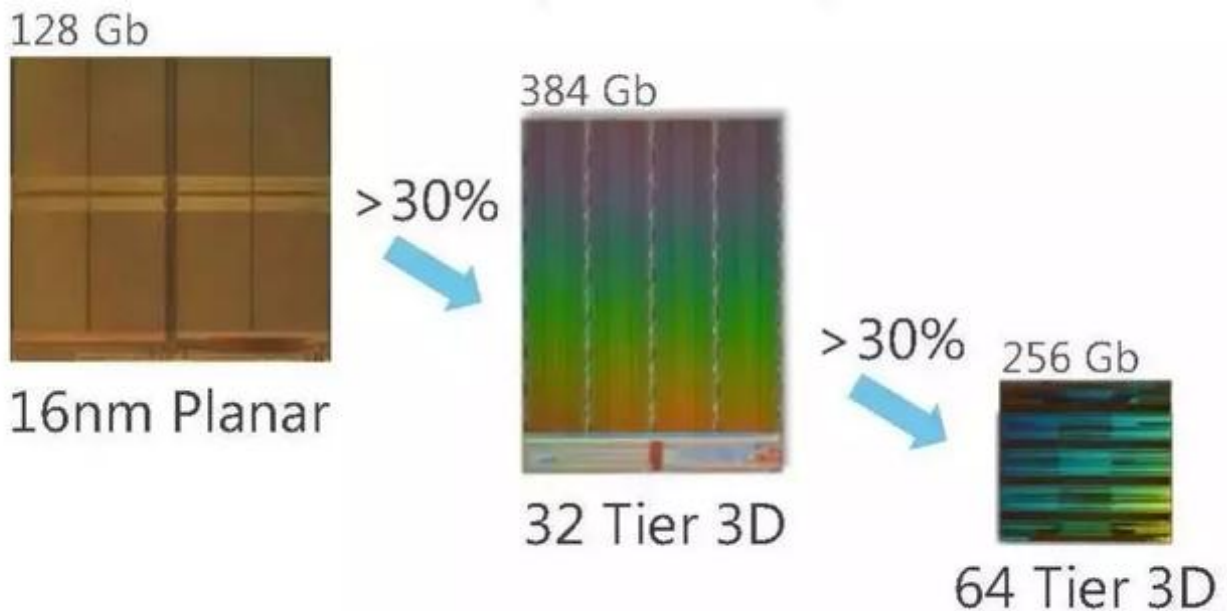


圖 | NAND單位存儲空間成本下降

2018 年長江存儲的 32 層 3D NAND 技術會小量試產，但更重要的戰場，是要再次挑戰 64 層 3D NAND 技術的成功。

趙偉國出席世界網際網路大會的全球數字經濟論壇上也表示，長江存儲明年將進入 64 層 128G 的 3D NAND 晶元，估計還要再花上 20 億美元的研發費用。

再者，紫光早早規劃好投資規模高達 240 億美元、單月產能 30 萬片的武漢 12 寸存儲器生產基地就可以正式開始啟動，該時間點預計是 2019~2020 年。

另一個被美光的專利大刀追著跑，從台灣追殺一路到美國的福建晉華和聯電，其 DRAM 合作方式與其他陣營有著不同的模式。

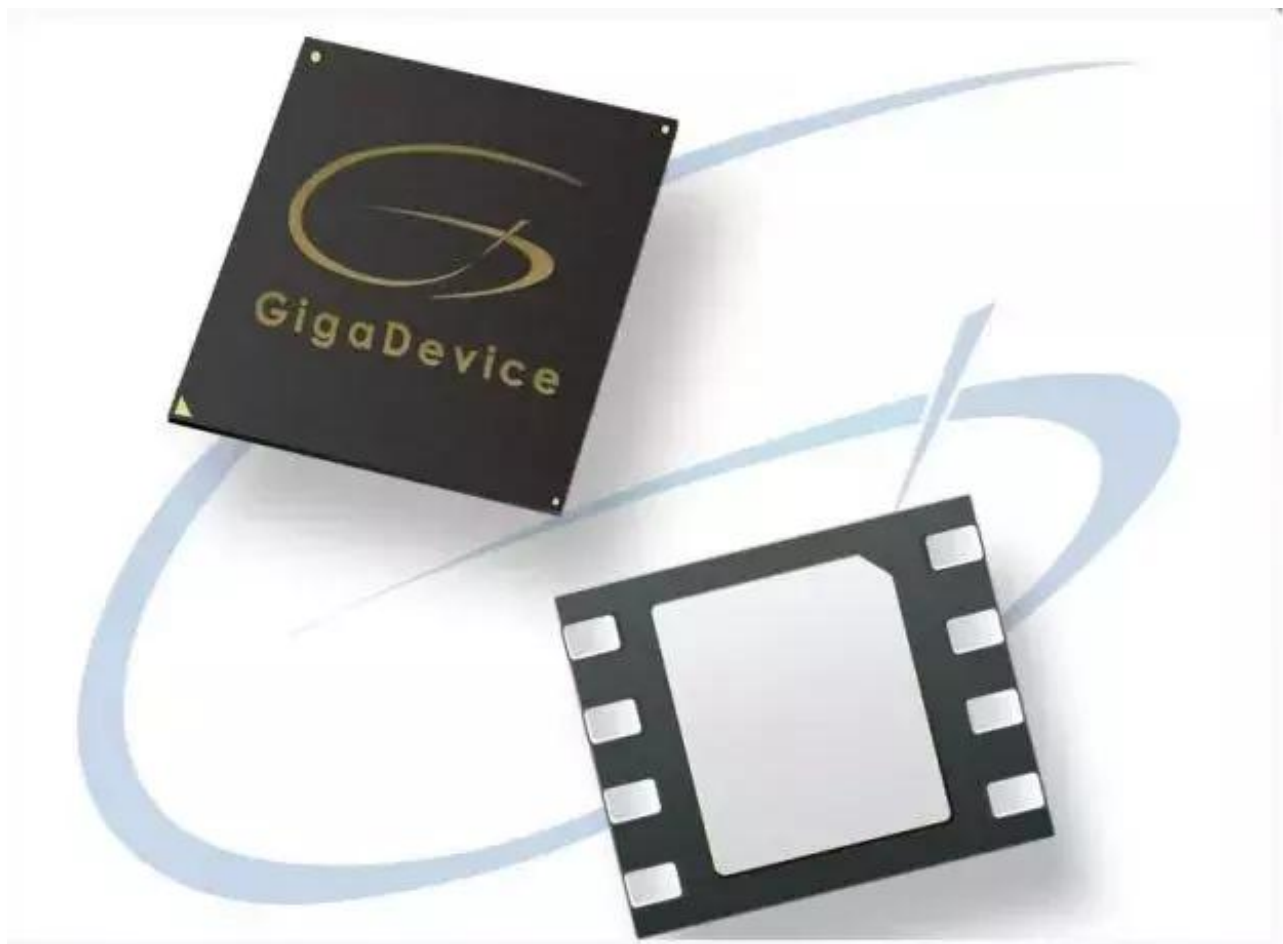


聯電在 2016 年接受福建晉華的委託，開發 DRAM 相關的製程技術，根據技術開發的進度，由福建晉華支付聯電技術報酬金，當做是開發費用，而最後研發的 DRAM 技術，將是由雙方共同擁有。

在上述的合作協議下，聯電將上百人的 DRAM 研發團隊和試產線設立在台灣南科，同時進行 2x 納米和 3x 納米兩個製程的研發。

另一個 DRAM 陣營是合肥睿力，從成立至今的形式作風非常低調。該陣營的主導者有前半導體設備大廠應用材料(Applied Materials) 全球執行副總、前中芯國際總裁兼 CEO 王寧國，以及前華亞科高層劉大維等。

合肥睿力的布局從今年下半年開始，陸續浮上檯面。其中包括與 NOR Flash 大廠北京兆易創新 (GigaDevice) 的合作，兆易創新宣布和合肥市政府達成協議，計劃共同出資人民幣 180 億元 (兆易創新出資 20%、合肥市產業投資控股集團出資 80%)，同時研發 19 納米 DRAM 技術，兆易創新也從此協議中，可獲得保障產能。



北京兆易創新雖然是從小池塘的 NOR Flash 產業起家，但一直有想要跨足大江大海的 DRAM 產業的雄心壯志，早在一年前多就傳遍存儲器產業，只是公司一直沒有正面承認。

直到今年 9 月，集成電路產業發展基金(大基金)宣布入股兆易創新約 11% 股權，成為第二大股東，該公司在 DRAM 產業的布局、攜手合肥睿力的消息，才在近幾個月密集對外揭露。

這兩大 DRAM 陣營目標，都是在 2018 年底完成研發和試產，推估要真正進入量產，最快也是 2019 年，因此，2019 年會是中國存儲產業的關鍵年，屆時有福建晉華、合肥睿力的 DRAM 技術見真章，更有長江存儲轉進 64 層 3D NAND 的研發和生產，未來 2 年，這幾家廠商一波跟著一波的研發與量產進展，將左右未來十年中國存儲產業的命運。2019 年，將會是中國半導體產業非常精彩的一年。

EXHIBIT 6



Fujian Jinhua Integrated Circuit Co., Ltd.

福建省晉華積體電路有限公司

福建省晉華積體電路有限公司(簡稱晉華積體電路)是由福建省電子資訊集團、晉江能源投資集團有限公司等共同出資的先進積體電路生產企業。公司於 2016 年與臺灣聯華電子簽屬技術開發合同，預計 2016-2019 年將投資 53 億美元，于福建省晉江市建設 12 吋記憶體晶圓廠生產線，並開展記憶體及關連產品的研發、製造和銷售。

晉華積體電路已納入中國「十三五」積體電路重大生產力佈局規劃，公司目標是建設具有國際半導體主流技術能力和掌握核心智慧財產權的記憶體（DRAM）公司，業務涵蓋研發、運營、產品設計與銷售，並爭取 3-5 年在國內主機板上市。

資訊時代，積體電路已成中國戰略性基礎產業，歡迎在記憶體領域中具有先進製程技術研發、運營、產品設計、銷售等經驗的國際專業人才一同加入。

招募職缺 Job opening

類別 Category	功能 Function	職務描述 Job Description
研發 Research & Development	DRAM Process Technology	Advanced nanometer process technology research and development
	DRAM Product Design	Diversified DRAM product design
	DRAM Device Design	DRAM Device research and development
製造	DRAM Process	Semiconductor manufacturing

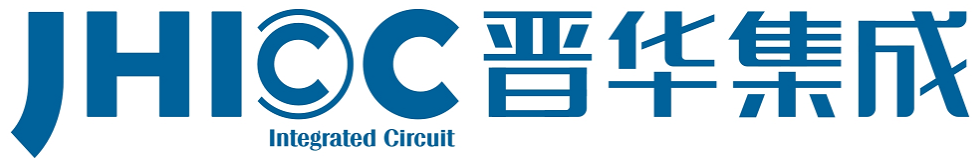
Production Technology		process improvements and maintenance
	DRAM Equipment	Management and maintenance of production equipment
	DRAM Process Integration	Process integration to improve production yield and promote sustainable process optimization
	Testing	Testing software development and maintenance of testing equipment
生產支援 Production Supporting	Sales & Marketing	DRAM business planning & marketing

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Fujian Jinhua Integrated Circuit Co., Ltd.

福建省晉華積體電路有限公司

Fujian Jinhua Integrated Circuit Co., Ltd. (Jinhua IC) is an IC maker with cutting-edge technology which is major invested by Fujian Electronics & Information (Group) Co., Ltd., and Jinjiang Energy Investment Co., Ltd. It has signed a technology development contract with United Microelectronics Corporation which is located in Taiwan and planned to invest 5.3 billion US dollars during Y2016 to Y2019 to build up a 12” fabrication facility in Jinjiang City, Fujian Province, China. Jinhua will develop the related technology, production and marketing of memory products.

Jinhua has been one item of IC crucial productivity scheme in China’s 13th-Year Plan and aims to establish a DRAM company with international mainstream technology and core intellectual property. Jinhua’s business includes R&D, production, product design and sale, and it strives to list on domestic main-board market within 3 to 5 years.

During the information age, IC has been the strategic and fundamental industry in China. Supported by China and Taiwan as well as Chinese State Fund, Jinhua welcomes professionals in advanced process technology development, production, product design and sale fields worldwide to join.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the above and foregoing documents have been served on March 1, 2018 to all counsel of record who are deemed to have consented to electronic service via the Court's CM/ECF system.

Executed on March 1, 2018, at San Diego, California.

By: s/ Randall E. Kay
Randall E. Kay